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Reply to Written Opinion

Dear Sirs,

In reply to the Written Opinion of the international searching authority, mailed 10 May 2005, pertaining to the above patent application, we hereby submit our arguments for patentability.

A Demand under Art. 31 PCT was filed on 16 November 2005.

Claim amendments

Please find enclosed an amended claim set, as well as a copy wherein the amendments are marked.

Claims 39 and 44-45 have been deleted. No non-allowable subject-matter has been introduced by the amendments preformed.

Novelty

It is stated in the Written Opinion that former claims 40-43, now claims 39-42, directed to a system for determining a property of a medium, lack novelty.

We respectfully disagree, as the cited document D2 does not disclose one single embodiment that comprises all the features of claim 39.

In item 4.1 of the Written Opinion, the Examiner refers to paragraph 55 in D2. This paragraph is a description of an embodiment of the invention illustrated in figures 7 and 8. These figures show neither a colour indicator nor an incubator for supporting a container, which are essential features of claim 39. Thus, the cited embodiment of the invention in D2 does not seem to be novelty destroying against claim 39 of the present application.

In general, the specific embodiments of D2 are incubator chambers in which different plates are placed, incubated and image processed. These incubator chambers do not contain, nor are they connected to, a container containing an indicator to be introduced into the sample.

In our opinion, no single, specific embodiment of D2 discloses all the essential features of claim 39.

Therefore, we kindly ask the Examiner to acknowledge that the subject-matter of claims 39-42 is indeed novel.

Inventive step Art 33(3) PCT

In the Written Opinion it is stated that the subject-matter of claims 1-38 does not involve an inventive step. We respectfully disagree.

D1 discloses a method for determining the bioactivity of biological samples using a micro colorimeter. It is stated in D1 that this method provides flexibility and that many samples can be read within a very short period of time (col 15, l. 46).

A difference between the present invention and the disclosure of D1 is that the determination is performed using a scanner or a digital camera. It is stated in item 3.3 of the written opinion that the subject-matter of claim 1 differs from the disclosure of D1 in that the determination is performed simultaneously. We submit that this difference cannot be used as the basis for formulation of an "objective technical problem" as it may contain a pointer to the solution.

D2 relates to detection and/or screening of microorganisms on an instrument, and concurrently or consecutively on the same instrument, determining the susceptibility of microorganisms to various antibiotics and/or identifying microorganisms (cf. [0015]). The instrument has a means for image acquisition, such as a CCD linear array scanner, a laser scanning camera, or other device that would provide an image of the plate (cf. [0060]).

In paragraph [0016] it is disclosed that: "Because the system performs a variety of functions, there are several types of specialized plates that are used within the instrument. Each type of plate is optimally configured for its particular function; hence, the plates may differ significantly in terms of culturing and detection properties, and physical dimensions. However, all plates, regardless of type, can be processed by the instrument."

The teaching of D2 is that an image acquisition device, such as the linear array scanner, has to be used in the instrument of D2 in order to make the system able to perform all the necessary functions, due to the diversity of the plates used (please compare figures 9, 11, 14 and 16). It does not seem possible to use other means of data acquisition than image acquisition, such as a microcolorimeter (cf. D1), which is not mentioned as an alternative. Thus, even though it might turn out that the scanner or camera inherently provides a fast and simultaneous determination of chemical or physical properties of a plurality of individual samples, the scanner or camera is not used for that purpose, and nowhere in D2 is it mentioned that an image acquisition device could be used for the purpose of fast and simultaneously determination.

Furthermore, as D2 discloses a large and complicated system for performing many diverse functions on different types of plates, the person skilled in the art would not consider D2 when looking for a solution to a problem relating to e.g. a microarray plate system.

We conclude that a person skilled in the art is not prompted to use an image acquisition device as disclosed in D2 when looking for an improvement to (or an alternative of) the apparatus disclosed in D1.

Based on hindsight, even thought the person skilled in the art could use an image acquisition device as in D2, there is no reason to believe that he would introduce it into the method of D1, as it is stated in D1 that in this method many samples can be read within a very short period of time (col 15, l. 46), and there are no hints in D2 that capturing a digital image gives any advantages over the microcolorimeter, e.g. relating to speed.

We submit that the subject-matter of claims 1-38 is inventive.

The subject matter of claim 34-38 further differs from the disclosure of D1 in that the viscosity of the turbid medium is determined. We submit that neither D1 nor D2 discloses a method to determine the viscosity of a sample and therefore a person skilled in the art, facing the problem to provide a method for determining viscosity, would never consider the disclosures of D1 or D2 and certainly not combine the disclosures of the two documents.

We kindly ask the Examiner to acknowledge that the present invention indeed involves an inventive step.

CONCLUSION:

It is believed that by the above amendments of the claims and the description, and in view of the above argumentation, the application now fulfils the requirements of the PCT, and a favourable consideration of the application is requested.

We request that a second Written Opinion is issued in case of any adverse decision, i.e. if the novelty and inventive step of the pending claims are not accepted.

This response and the enclosed submissions do not imply the abandonment of any subject matter previously filed in relation to this application, and the applicant reserves the right to reinstate any cancelled subject matter at a later stage.

Yours sincerely

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IPR & Licensing

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European Patent Attorney

EPO Form 1037
Amended claims

Claims

1. A method for simultaneous determination of a biological, chemical and/or physical property of a plurality of individual samples of a turbid medium comprising the steps:

i) arranging said individual samples of the medium comprising a color indicator in an array;

ii) allowing said color indicator to interact with said samples;

iii) providing picture capturing means for capturing a digital image of the color developed on a surface of said samples following said interaction;

iv) using said digital image to obtain a digital value representation for said property, said value representation being used for calculating a value for said property.

2. The method of claim 1 further comprising the step of comparing said digital value with the values obtained from a standardised set of samples having a range of known values representing said property to obtain a calculated value for said property.

3. The method according to claims 1 or 2, wherein said array is in the form of a container, such as a microtitre plate, having a plurality of wells arranged in an array format, said plurality being in the range of between 2 and 4000, such as 6, 24, 96, 384, or 1536 wells.

4. The method according to any one of claims 1 through 3, wherein said container has an transparent surface, such as a top or a bottom.

5. The method according to any one of claims 1 through 4, wherein said means for determination of color is a color-enabled photoelectric scanning device, that produces a digital color representation of said surface.

6. The method according to any one of claims 1 through 5, wherein said means is a scanning device.

7. The method according to any one of claims 1 through 6, wherein said scanning device is one of a line-by-line operating autofeed scanner, a flatbed scanner, a digital video camera and a digital camera.

8. The method according to any one of claims 1 through 7, wherein said scanning device operates on an at least partly open or transparent end of said container to generate an image file recording of the color of said sample.

9. The method according to claim 8, wherein said scanning device operates through the bottom of said container.

10. The method according to any one of claims 1 through 9, wherein digital image processing methods are used to obtain an image file for determining the measuring positions from the digital color representation of said surface and for calculating said value for said property.

11. The method according to any one of claims 1 through 10 further comprising the step of illuminating the at least partly transparent surface of the container in connection with determining said color.

12. The method according to any one of claims 8 through 11, further comprising the steps:

i) analyzing said image file and generation of data values for image parameters by means of an analyzer; and

ii) translating said data values for image parameters to a value representing said chemical and/or physical property of said sample by means of said analyzer.

13. The method according to any one of claims 1 through 12, wherein said medium is liquid, semi-liquid or a gel.

14. The method according to any one of claims 1 through 13, wherein said medium is selected from the group consisting of biological fluids, such as dairy products, oil products, fruit juice products including jelly, spice products, beverages, whole blood, serum, or any combination thereof; as well as emulsions including latex emulsions, mayonnaise, salad dressings, skin lotions and skin tonics.

15. The method according to any one of claims 1 through 14 wherein said medium contains live microorganisms, such as yeasts or lactic acid bacteria or both.

16. A method according to any one of claims 8 through 15, wherein said image file comprises an image format such as Synchronized Multimedia Integration Language (SMIL) format, any JPEG format, any Graphics Interchange Format (GIF), Computer Graphics Metafile, TIFF, BIFF, bmp, Clear, FITS, NFF, OFF, PCX, PNG, TGA, XBM, mod, Portable Document Format (PDF), Portable Network Graphics, Portable Pixmap, progressive coding, Quicktime, RIFF, Self Extracting Archive, sequential coding, server-parsed HTML, sprite, Tagged Image File Format, targa, Targa Graphics Adaptor, thumbnail, wav, WebCGM, wireless bitmap, xpm or a different frame rate video or similar format.

17. A method according to claim 12, wherein said image parameters comprise lightness, chroma, Hue angle, or any combination thereof.

18. A method according to claim 17, wherein said Hue angle determined from said image file is correlated with a pH level of said sample.

19. A method according to any one of claims 5 through 18, wherein said scanning of said container comprises scanning at predetermined intervals, preferably in the range from about 0.00001 second to about 60 to 120 minutes.

20. A method according to claim 12, wherein said analyzing of said image file is performed in predetermined regions of said container.

21. A method according to any one of claims 12 through 20 which further comprises saving said image parameters in a data file.

22. A method according to claim 21, wherein said data file is a comma-separated-value type file, a space-separated-value type file, a text type file, or any combinations thereof.

23. A method according to any one of claims 21 and 22 further comprising presenting said data file in graphical or textual form by means of a display.

24. A method according to any one of claims 12 through 23, wherein said analyzer comprises a digital processor such as in a computer, a server system, a personal digital assistant, a cell phone, or any combination thereof.

25. A method according to claim 24, wherein said analyzer further comprises a memory device for storing an analyzing program code to be executed by the processor, for storing image files recorded by the scanner, and for storing data values generated by the analyzer.

26. A method according to any one of claims 24 and 25, wherein said memory device and/or said scanner is adapted to connect to said processor through a computer network such as a dedicated line network, a local area network, a wide area network, a metropolitan area network, or an inter-network.

27. A method according to any one of claims 12 through 26, wherein said analyzer further comprises a display for displaying progress of said analyzing of said image file and/or displaying said data file such as a monitor for presenting textual or graphical data such as a personal computer monitor, personal digital assistant monitor, cell phone display, or any combination thereof.

28. The method according to any one of claims 1 through 27, wherein said property is the pH of the medium.

29. The method according to any one of claims 1 through 28, wherein said color indicator is a pH indicator.

30. The method according to claim 29, wherein said pH indicator is adapted to indicate pH levels between 3 and 8, the indicators being preferably selected from the group consisting of bromocresol green, bromocresol purple, bromophenol blue, bromothymol blue, chlorophenol red, phenol red, etc.

31. The method according to any one of claims 1 through 30, wherein said medium is milk, a processed milk product, whey, and/or a bacteriological medium optionally comprising live lactic acid bacteria.

32. The method according to claim 31, which further comprises adding bacterial cultures to said sample in said array or container.

33. The method according to claim 31, wherein determination of pH is an indication of bacteriophage infection of the lactic acid bacteria.

34. The method according to any one of claims 1 through 27, wherein said property is the viscosity of the medium.

35. The method according to claim 34, wherein said medium is yogurt.

36. The method according to any one of claims 34 and 35 wherein said color indicator is brilliant blue or Ruthenium Red.

37. The method according to any one of claims 34 through 36, wherein said color indicator is added to the top surface of or into the sample after adding the sample to the container.

38. The method according to any one of claims 34 through 37, wherein said color indicator is allowed to interact with said sample according to a predetermined time wherein a development at the bottom of said sample surface is known to correspond to a specific viscosity of said medium.

39. A system for determining a chemical or physical property of a turbid medium comprising:

i) a container for containing a sample of said medium;

ii) a indicator to be introduced in said sample said indicator being adapted to indicate a specific value of said property by a specific color;

iii) an incubator for supporting said container and incubating said sample contained in said container;

iv) a scanner or digital camera for scanning said container thereby generating an image file recording the color of said sample having reacted with the indicator,

v) an analyzer for analyzing said image file and generating data values for image parameters for said image file and determining the value of said property of said sample from said image parameters.

40. The system of claim 39 wherein said property is the acidity of said medium as measured by pH and said indicator is a pH indicator.

41. The system of claim 39 wherein said property is the viscosity of said medium and said indicator is a colored substance characterised in having a time for penetration of said sample which is correllated with the viscosity of said sample.

42. A system according to any one of claims 39 through 41, wherein said system comprises any feature of the method according to any one of claims 1 through 38.

Claims

1. A method for simultaneous determination of a biological, chemical and/or physical property of a plurality of individual samples of a turbid medium comprising the steps:

i) arranging said individual samples of the medium comprising a color indicator in an array;

ii) allowing said color indicator to interact with said samples;

iii) providing picture capturing means for capturing a digital image of the color developed on a surface of said samples following said interaction;

iv) using said digital image to obtain a digital value representation for said property, said value representation being used for calculating a value for said property.

2. The method of claim 1 further comprising the step of comparing said digital value with the values obtained from a standardised set of samples having a range of known values representing said property to obtain a calculated value for said property.

3. The method according to claims 1 or 2, wherein said array is in the form of a container, such as a microtitre plate, having a plurality of wells arranged in an array format, said plurality being in the range of between 2 and 4000, such as 6, 24, 96, 384, or 1536 wells.

4. The method according to any one of claims 1 through 3, wherein said container has an transparent surface, such as a top or a bottom.

5. The method according to any one of claims 1 through 4, wherein said means for determination of color is a color-enabled photoelectric scanning device, that produces a digital color representation of said surface.

6. The method according to any one of claims 1 through 5, wherein said means is a scanning device.

7. The method according to any one of claims 1 through 6, wherein said scanning device is one of a line-by-line operating autofeed scanner, a flatbed scanner, a digital video camera and a digital camera.

8. The method according to any one of claims 1 through 7, wherein said scanning device operates on an at least partly open or transparent end of said container to generate an image file recording of the color of said sample.

9. The method according to claim 8, wherein said scanning device operates through the bottom of said container.

10. The method according to any one of claims 1 through 9, wherein digital image processing methods are used to obtain an image file for determining the measuring positions from the digital color representation of said surface and for calculating said value for said property.

11. The method according to any one of claims 1 through 10 further comprising the step of illuminating the at least partly transparent surface of the container in connection with determining said color.

12. The method according to any one of claims 8 through 11, further comprising the steps:

i) analyzing said image file and generation of data values for image parameters by means of an analyzer; and

ii) translating said data values for image parameters to a value representing said chemical and/or physical property of said sample by means of said analyzer.

13. The method according to any one of claims 1 through 12, wherein said medium is liquid, semi-liquid or a gel.

14. The method according to any one of claims 1 through 13, wherein said medium is selected from the group consisting of biological fluids, such as dairy products, oil products, fruit juice products including jelly, spice products, beverages, whole blood, serum, or any combination thereof; as well as emulsions including latex emulsions, mayonnaise, salad dressings, skin lotions and skin tonics.

15. The method according to any one of claims 1 through 14 wherein said medium contains live microorganisms, such as yeasts or lactic acid bacteria or both.

16. A method according to any one of claims 8 through 15, wherein said image file comprises an image format such as Synchronized Multimedia Integration Language (SMIL) format, any JPEG format, any Graphics Interchange Format (GIF), Computer Graphics Metafile, TIFF, BIFF, bmp, Clear, FITS, NFF, OFF, PCX, PNG, TGA, XBM, mod, Portable Document Format (PDF), Portable Network Graphics, Portable Pixmap, progressive coding, Quicktime, RIFF, Self Extracting Archive, sequential coding, server-parsed HTML, sprite, Tagged Image File Format, targa, Targa Graphics Adaptor, thumbnail, wav, WebCGM, wireless bitmap, xpm or a different frame rate video or similar format.

17. A method according to claim 12, wherein said image parameters comprise lightness, chroma, Hue angle, or any combination thereof.

18. A method according to claim 17, wherein said Hue angle determined from said image file is correlated with a pH level of said sample.

19. A method according to any one of claims 5 through 18, wherein said scanning of said container comprises scanning at predetermined intervals, preferably in the range from about 0.00001 second to about 60 to 120 minutes.

20. A method according to claim 12, wherein said analyzing of said image file is performed in predetermined regions of said container.

21. A method according to any one of claims 12 through 20 which further comprises saving said image parameters in a data file.

22. A method according to claim 21, wherein said data file is a comma-separated-value type file, a space-separated-value type file, a text type file, or any combinations thereof.

23. A method according to any one of claims 21 and 22 further comprising presenting said data file in graphical or textual form by means of a display.

24. A method according to any one of claims 12 through 23, wherein said analyzer comprises a digital processor such as in a computer, a server system, a personal digital assistant, a cell phone, or any combination thereof.

25. A method according to claim 24, wherein said analyzer further comprises a memory device for storing an analyzing program code to be executed by the processor, for storing image files recorded by the scanner, and for storing data values generated by the analyzer.

26. A method according to any one of claims 24 and 25, wherein said memory device and/or said scanner is adapted to connect to said processor through a computer network such as a dedicated line network, a local area network, a wide area network, a metropolitan area network, or an inter-network.

27. A method according to any one of claims 12 through 26, wherein said analyzer further comprises a display for displaying progress of said analyzing of said image file and/or displaying said data file such as a monitor for presenting textual or graphical data such as a personal computer monitor, personal digital assistant monitor, cell phone display, or any combination thereof.

28. The method according to any one of claims 1 through 27, wherein said property is the pH of the medium.

29. The method according to any one of claims 1 through 28, wherein said color indicator is a pH indicator.

30. The method according to claim 29, wherein said pH indicator is adapted to indicate pH levels between 3 and 8, the indicators being preferably selected from the group consisting of bromocresol green, bromocresol purple, bromophenol blue, bromothymol blue, chlorophenol red, phenol red, etc.

31. The method according to any one of claims 1 through 30, wherein said medium is milk, a processed milk product, whey, and/or a bacteriological medium optionally comprising live lactic acid bacteria.

32. The method according to claim 31, which further comprises adding bacterial cultures to said sample in said array or container.

33. The method according to claim 31, wherein determination of pH is an indication of bacteriophage infection of the lactic acid bacteria.

34. The method according to any one of claims 1 through 27, wherein said property is the viscosity of the medium.

35. The method according to claim 34, wherein said medium is yogurt.

36. The method according to any one of claims 34 and 35 wherein said color indicator is brilliant blue or Ruthenium Red.

37. The method according to any one of claims 34 through 36, wherein said color indicator is added to the top surface of or into the sample after adding the sample to the container.

38. The method according to any one of claims 34 through 37, wherein said color indicator is allowed to interact with said sample according to a predetermined time wherein a development at the bottom of said sample surface is known to correspond to a specific viscosity of said medium.

~~39. A colorimetric micro-assay substantially as described in Example 3 and Fig. 9 herein.~~

4039. A system for determining a chemical or physical property of a turbid medium comprising:

i) a container for containing a sample of said medium;

ii) a indicator to be introduced in said sample said indicator being adapted to indicate a specific value of said property by a specific color;

iii) an incubator for supporting said container and incubating said sample contained in said container;

iv) a scanner or digital camera for scanning said container thereby generating an image file recording the color of said sample having reacted with the indicator,

v) an analyzer for analyzing said image file and generating data values for image parameters for said image file and determining the value of said property of said sample from said image parameters.

~~41~~40. The system of claim ~~40~~ 39 wherein said property is the acidity of said medium as measured by pH and said indicator is a pH indicator.

~~42~~41. The system of claim ~~40~~ 39 wherein said property is the viscosity of said medium and said indicator is a colored substance characterised in having a time for penetration of said sample which is correllated with the viscosity of said sample.

~~43~~42. A system according to any one of claims ~~40~~ 39 through ~~42~~41, wherein said system comprises any feature of the method according to any one of claims 1 through ~~39~~38.

~~44. A computer program comprising code adapted to perform the following actions when said program is run on a data processing system:~~

~~i)control of scanning of a container containing a sample;~~

~~ii)generation of an image file of one surface of said container;~~

~~iii)identification of a color of said one surface of said container;~~

~~iv)analysis of said image file and generation of data values for image parameters; and~~

~~v)translation of image parameters to a pH value of said sample.~~

~~45. A computer program according to claim 44, wherein said computer program comprises any features of the method according to any one of claims 1 through 39 and/or features of said system according to any one of claims 40 through 43.~~